The Role and Implementation of Analysis Support Centers

H. Gordon, S. Rajagopalan, J. Shank, M. Tuts, S. Willocq

14 Feb 2006

Support for the detector performance and physics analysis activities of U.S. ATLAS is provided by three Analysis Support Centers (ASC), an Analysis Support Group (ASG) consisting of experts in the different areas of software required to perform a complete analysis and a series of Analysis Forums for discussion and interaction among physicists working in specific areas of detector performance and physics analysis, see the presentation at http://people.umass.edu/willocq/atlas/AnalysisSupport/USATLAS_Analysis_Support_DOENSF_9Feb06.ppt. The goal of these support structures is to facilitate the integration of U.S. physicists into the overall ATLAS detector performance and physics analysis structure. This document defines the requirements for and implementation of the Analysis Support Centers (ASC).

U.S. ATLAS has selected three ASCs:

- Argonne National Laboratory (Midwest region)
- Brookhaven National Laboratory (Eastern region)
- Lawrence Berkeley National Laboratory (Western region)

The mission of the ASCs is to support detector performance and physics analysis activities. They are expected to provide a welcoming entry point for newcomers to the Collaboration. This means U.S. ATLAS physicists can expect to receive training on how to use ATLAS software via tutorials and one-on-one interaction. This also means that newcomers receive an overview of the ATLAS experiment, including an overview of analysis activities. After training, physicists are expected to return for occasional visits to the ASC for help with their analysis and/or for help with more advanced software features. Furthermore, the centers can provide focal points for analysis meetings for the physicists in the region and also for occasional face-to-face meetings of the Analysis Forums. The ASCs are then home to a community of users making occasional visits and contributing to the intellectual vitality of the centers. The ASCs must play an active role to ensure that U.S. physicists effectively participate in the overall ATLAS working groups.

We expect new U.S. institutes joining ATLAS to seek assistance and support in identifying potential areas of involvement in ATLAS. We also expect existing U.S. institutes transitioning from the construction phase and wishing to get involved in the LHC physics effort. The responsibility for this assistance falls with the U.S. ATLAS Research Program Management and not with the Analysis Support Centers.

1. Infrastructure

Each ASC must provide the following infrastructure to host visitors, tutorials and working meetings:

- Office space (with phone) for visiting graduate students, postdocs, research staff and faculty. Such visits could be brief (several days) or more extended (several weeks or months). Space should be available for on order of 10 visitors, with the possibility of growth as the need arises
- Access from personal laptops to networking and printing capabilities
- Access to stationery, copy/fax machines, coffee machine
- Secretarial assistance
- Meeting rooms for tutorials and face-to-face analysis meetings
- Video and phone conferencing facilities

2. Software Support

Each ASC should identify and provide people (equiv. to a total of approximately 1 FTE) for software support (tutorials or one-on-one help) in the following areas:

- General software (Athena, CMT, how to run event generation, simulation, digitization, reconstruction)
- Physics analysis tools (analysis of ESD/AOD/TAG)
- Distributed analysis, grid use

The support person(s) should also have familiarity in the following areas:

- Access and use of computing resources at Tier 1 and Tier 2 centers, including batch systems
- Software release and computing environment

In addition, the support person should be able to act as a liaison with the production/data managers at the Tier 1 and Tier 2 centers to tie the needs of U.S. physicists with the resources available at the facilities.

Additional areas of support will be available at each ASC as some members of the ASG will be stationed at an ASC. ASG members should be willing to travel to ASCs for occasional meetings to work on analysis issues requiring their expertise, if such support cannot be effectively provided via video or other means of communication.

The Research Program Plan calls for an initial allocation of 1 FTE at each Analysis Support Center who will provide the above support to U.S. physicists. Given the tightness of funding, we expect this will not start before FY07. The Labs are encouraged to find alternate funding for the short term.

3. Expertise

Each of the Analysis Centers is expected to achieve a significant level of expertise in some of the detector performance areas. It is also recognized that any one center cannot have the expertise in all possible areas – hence this emphasizes the need for the ASCs to effectively communicate with each other and through the ASG to establish access to a broad range of expertise necessary to support physics analysis. Below are the areas of initial expertise suggested for the three Analysis Support Centers.

ANL:

- Tile Calorimeter simulation and reconstruction
- Jet Reconstruction
- Hadronic Calibration and jet in-situ calibration
- --- needs to be completed after discussion with ANL

BNL:

- LAr Calorimeter simulation and reconstruction
- e-gamma reconstruction
- EM calibration
- Trigger software for e-gamma, jets and Missing E_T

In collaboration with the regional groups, BNL should also provide expertise for:

- Muon Spectrometer simulation and reconstruction
- Muon calibration and alignment
- b-tagging
- Support for Analysis Tools and techniques
- --- needs to be completed after discussion with BNL

LBNL:

- Inner Detector simulation and reconstruction
- Vertexing, b-tagging and secondary vertex reconstruction
- --- needs to be completed after discussion with LBNL

It is important that sufficient personnel and expertise exist at the ASC to become a viable support center. The critical mass to support the above activities must be identified by each ASC, including the fraction of time they can dedicate to the above activities. The identified people must themselves be involved in the ATLAS software development activities in the above areas in addition to providing support for U.S. physicists. To establish a healthy environment that supports U.S. analysis activities, we expect a minimum of 3 FTEs to be involved in the above listed detector performance studies, larger for ASCs involved in a large number of topics.

In addition to the above software and performance topics, we expect each ASC to also be involved in at least one or more ATLAS physics analysis topics. This ensures a healthy environment for an analysis support center. The ASC should therefore identify the people

and the physics analysis in which they are involved. The ASC should at least have 2 FTEs involved in the end physics analysis, this number growing with the approaching ATLAS run time operations.

4. ASC Coordination

Each ASC must identify a coordinator who can oversee and attend to the developments at the support center. This individual will also become the contact point for U.S. institutes to discuss visits to the center. The ASC coordinator will become the liaison between U.S. physicists and the local expertise. The ASC coordinator should be able to spend at least 20% of his/her time on this activity.

The ASC coordinators need to interact with each other and the ASG chair on a monthly basis. The goal of such meetings is to address common analysis support issues, to exchange support and analysis solutions and to guarantee a level of coherence between the different centers. In particular, we should avoid duplication of effort, especially concerning the development of tutorials and solutions of common analysis issues. The ASCs must strive to adhere to ATLAS software standards and practices while providing support to U.S. physicists.

It is ultimately the role of the ASG chair to ensure coherence of the support provided by the three ASCs. In particular, the ASG chair will:

- Make sure that the U.S. ATLAS web site and the common support information is maintained and up to date (see below)
- Compile ASC-use metrics that are to be collected by each ASC
- Organize monthly coordination meeting with ASC coordinators

5. Relation between BNL ASC and Tier 1 Center

In the analysis support issues, BNL plays a special role because of the co-location of the Tier 1 center. The ASC coordinators at each of the centers should make use of the resources available at the Tier 1 center. In this regard the BNL ASC coordinator should be in close contact with the other ASC coordinators to ensure that the resource availability of the Tier 1 center is well publicized and established.

In addition, the BNL ASC needs to maintain the U.S. ATLAS web site and, in particular, the common support web documentation, which includes use of the Tier 1 computing facility, tutorials, as well as ASG and Analysis Forum information.

6. Metrics to Assess the Effectiveness of Analysis Support Centers

The effectiveness of the Analysis Support Centers needs to be measured to make sure they are fulfilling their role for the U.S. ATLAS Collaboration. Such metrics include:

- Number of physicists who received analysis support from an ASC (via tutorials, one-on-one help, or extended visits), expressed in number of user-hours
- Number of detector performance studies and physics analyses led by physicists who received support from an ASC (ultimately, will use the number of published papers)
- Number of talks given at ATLAS meetings by people who started with associations with an ASC
- Number of face-to-face analysis meetings held
- Attendance by visiting physicists at these meetings
- Number of visitors making use of office space, expressed in number of visitor-days

It would be good if each ASC had an external advisory committee to give direct and timely feedback into its performance.

7. Timeline for Implementation of the Analysis Support Centers

The Analysis Support Centers should submit a Memorandum Of Understanding which details the resources, people and the areas of expertise as outlined in this document. We expect the MOUs to be submitted by each ASC before February 28, 2006.

These MOUs will be reviewed and approved by the U.S. ATLAS management.